

Claims

1. An electronic module, comprising:
  - a plurality of electrically conductive lead pins;
  - an electrically conductive base plate;
  - a first integrated circuit (IC) die attached to the base plate, wherein the IC die is electrically coupled to one or more of the lead pins;
  - at least one material block positioned adjacent the die and attached to the base plate, wherein the material block has a coefficient of thermal expansion (CTE) that is greater than a CTE of the die and less than a CTE of the base plate; and
  - an electrically non-conductive overmold encapsulating the die, the material block, the base plate and a portion of the lead pins.
2. The module of claim 1, wherein the overmold is an epoxy molding compound.
3. The module of claim 1, wherein the base plate is made of nickel-plated copper.
4. The module of claim 1, wherein the material block is made of alumina.
5. The module of claim 1, wherein the material block is rectangular and has about the same thickness as the die.
6. The module of claim 4, wherein the material block is attached to the base plate with solder.
7. The module of claim 1, wherein the material block has a CTE of about 7 ppm/ $^{\circ}$ C, the base plate has a CTE of about 17 ppm/ $^{\circ}$ C and

the die has a CTE of about 3 ppm/ $^{\circ}$ C and the overmold has a CTE in a range from about 10 ppm/ $^{\circ}$ C to about 13 ppm/ $^{\circ}$ C.

8. The module of claim 1, wherein the material block is attached to the base plate with solder.

9. The module of claim 1, further comprising:  
a substrate including a plurality of conductive traces, wherein the substrate is attached to the base plate; and  
a plurality of electronic components electrically coupled to the substrate, the electronic components including at least a second IC die, wherein the second IC die is electrically coupled to at least a portion of the conductive traces of the substrate and the first IC die.

10. The module of claim 1, wherein the base plate acts as a ground plane, and wherein the base plate is electrically coupled to at least one of the lead pins.

11. An electronic module, comprising:  
a plurality of electrically conductive lead pins;  
an electrically conductive base plate;  
a first integrated circuit (IC) die attached to the base plate, wherein the IC die is electrically coupled to one or more of the lead pins;  
at least one material block positioned adjacent the die and attached to the base plate, wherein the material block has a coefficient of thermal expansion (CTE) that is greater than a CTE of the die and less than a CTE of the base plate;  
an electrically non-conductive overmold encapsulating the die, the material block, the base plate and a portion of the lead pins;  
a substrate including a plurality of conductive traces, wherein the substrate is attached to the base plate; and

a plurality of electronic components electrically coupled to the substrate, the electronic components including at least a second IC die, wherein the second IC die is electrically coupled to at least a portion of the conductive traces of the substrate and the first IC die.

12. The module of claim 11, wherein the overmold is an epoxy molding compound.

13. The module of claim 11, wherein the base plate is made of nickel-plated copper.

14. The module of claim 11, wherein the material block is made of alumina.

15. The module of claim 11, wherein the material block is rectangular and has about the same thickness as the die.

16. The module of claim 15, wherein the material block is attached to the base plate with solder.

17. The module of claim 11, wherein the material block has a CTE of about 7 ppm/ $^{\circ}$ C, the base plate has a CTE of about 17 ppm/ $^{\circ}$ C and the die has a CTE of about 3 ppm/ $^{\circ}$ C and the overmold has a CTE in a range from about 10 ppm/ $^{\circ}$ C to about 13 ppm/ $^{\circ}$ C.

18. The module of claim 11, wherein the material block is attached to the base plate with solder.

19. The module of claim 11, wherein the base plate acts as a ground plane, and wherein the base plate is electrically coupled to at least one of the lead pins.

20. An electronic module, comprising:

- a plurality of electrically conductive lead pins;
- an electrically conductive base plate;
- a first integrated circuit (IC) die attached to the base plate, wherein the IC die is electrically coupled to one or more of the lead pins;
- at least one material block positioned adjacent the die and attached to the base plate, wherein the material block has a coefficient of thermal expansion (CTE) that is greater than a CTE of the die and less than a CTE of the base plate;
- an electrically non-conductive overmold encapsulating the die, the material block, the base plate and a portion of the lead pins;
- a substrate including a plurality of conductive traces, wherein the substrate is attached to the base plate; and
- a plurality of electronic components electrically coupled to the substrate, the electronic components including at least a second IC die, wherein the second IC die is electrically coupled to at least a portion of the conductive traces of the substrate and the first IC die; and wherein the material block is made of alumina.